

Department of Environmental Quality
Division of INL Oversight
and Radiation Control

ENVIRONMENTAL SURVEILLANCE PROGRAM QUARTERLY DATA REPORT

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Table of Acronyms

ANL-W	- Argonne National Laboratory West	MDA	- minimum detectable activity
BBWI	- Bechtel BWXT Idaho, LLC	MDC	- minimum detectable concentration
CERCLA	- Comprehensive Environmental Response Compensation and Liability Act	NIST	- National Institute of Standards and Technology
CFA	- Central Facilities Area	nCi/L	- nanocuries per liter
DEQ-INL	- The State of Idaho, Division of Idaho National Laboratory Oversight and Radiation Control	NOAA	- National Oceanic and Atmospheric Administration
DOE	- U.S. Department of Energy	NRF	- Naval Reactors Facility
EIC	- electret ionization chamber	pCi/L	- picocuries per liter
EML	- Environmental Monitoring Laboratory	pCi/m ³	- picocuries per cubic meter
ESP	- Environmental Surveillance Program	PM ₁₀	- particulate matter with aerodynamic diameter less than or equal to 10 micrometers
HPIC	- high-pressure ion chamber	PCE	- perchloroethene
LLD	- lower limit of detection	QA/QC	- Quality Assurance/Quality Control
IBL	- Idaho Bureau of Laboratories	RCRA	- Resource Conservation and Recovery Act
INEEL	- Idaho National Engineering & Environmental Laboratory	RWMC	- Radioactive Waste Management Complex
INTEC	- Idaho Nuclear Technology and Engineering Center	SD	- standard deviation
LSC	- liquid scintillation counting	TAN	- Test Area North
µg/L	- micrograms per liter	TCE	- trichloroethene
mg/L	- milligrams per liter	TDS	- total dissolved solids
mR/hr	- milliRoentgen per hour	TSP	- total suspended particulate
µR/hr	- microRoentgen per hour	TSS	- total suspended solids
		USGS	- U.S. Geological Survey
		VOC	- volatile organic compound
		WLAP	- Wastewater Land Application

Introduction

The state of Idaho, Division of Idaho National Laboratory Oversight and Radiation Control (DEQ-INL) Environmental Surveillance Program (ESP) is conducted at locations on the INEEL, on the boundaries of the INEEL, and at distant locations to the INEEL in accordance with accepted monitoring procedures and management practices. This program is designed to provide the people of the state of Idaho with independently evaluated information about the impacts of the Department of Energy's (DOE) activities in Idaho.

The primary objective for DEQ-INL's ESP is to maintain an independent environmental monitoring and verification program designed to verify and supplement DOE's data and programs. This program is also used to provide the citizens of Idaho with information that has been independently evaluated to enable them to reach informed conclusions about DOE activities in Idaho and potential impacts to public health and the environment.

Results of the ESP are published using two distinct reporting formats: quarterly data reports and an annual ESP report. The annual ESP report is designed for a more broad audience and summarizes the results of the ESP for the previous four quarters. The annual report's primary emphasis is to focus on trends, ascertain the impacts of DOE operations on the environment, and confirm the validity of DOE monitoring programs. This quarterly report is designed to provide the mechanism to document the results of the ESP on a quarterly basis and provide detailed data to those who wish to "see the numbers." It is organized according to the media sampled and also provides a quality assurance assessment.

Air and Precipitation Monitoring Results

The ESP operated eight air monitoring stations on and near the INEEL as well as two monitoring stations distant from the INEEL during the second, 2004 (**Figure 1**). These stations employed instrumentation for collecting airborne particulate matter (TSP and PM_{10}), gaseous radioiodine, precipitation, and water vapor for tritium analysis (**Table 1**). The Shoshone-Bannock Tribes operated an additional air monitoring station located at Fort Hall. Because this station uses identical instrumentation and sampling protocol, the DEQ-INL reports the data as an additional background site.

Starting in the first quarter of 2003, DEQ-INL designated the high-volume total suspended particulate (TSP) air sampler as the primary air sampler, thus replacing the aging PM_{10} samplers. There are currently two PM_{10} samplers collecting supplementary air data, along with radioiodine, at Mud Lake and Atomic City. The Shoshone-Bannock Tribes discontinued the use of their PM_{10} sampler at the beginning of the second quarter of 2004.

Weekly gross alpha and gross beta radioactivity results for filters from the TSP samplers are presented in **Appendix A** and summarized in **Table 2**. Gross alpha and gross beta radioactivity concentrations reported from the particulate samples were within the range of expected values for naturally occurring radioactivity observed historically. One weekly gross alpha/gross beta air sample was not collected due to an extended power failure at the Craters of the Moon National Monument monitoring station. The power failure resulted in an insufficient volume of air required for a representative sample. Other samples were collected normally at this location for the remaining weeks of the second quarter.

Weekly gross alpha and gross beta radioactivity results for the PM_{10} particulate air filters are presented in **Appendix B** and summarized in **Table 3**. Gross alpha and gross beta radioactivity concentrations reported from the particulate samples were within the range of expected values for naturally occurring radioactivity.

Composites of filters collected using TSP and PM₁₀ samplers during the course of a calendar quarter were analyzed using gamma spectroscopy. Typically, gamma spectroscopy results are only reported when exceeding a minimum detectable activity (MDA) or minimum detectable concentration (MDC). Gamma spectroscopy results for the second quarter of 2004 for TSP filters are presented in **Table 4** and gamma spectroscopy results for PM₁₀ filters are presented in **Table 5**. The only reported gamma-emitting radionuclide detected was beryllium-7, a naturally occurring, cosmogenic radionuclide.

Sample media, which collects gaseous radioiodine in air, were analyzed from 11 sample locations. No radioactive isotopes of iodine, specifically iodine-131, were detected on the weekly charcoal cartridges.

Atmospheric moisture samples were collected at 11 locations and analyzed for tritium. Atmospheric tritium concentrations were determined using the amount of tritium measured in the quantity of atmospheric moisture collected per volume of air sampled. Reported values were the result of either a single sample or a weighted mean when more than one atmospheric moisture sample was collected during the calendar quarter. Atmospheric tritium was detected at the Experimental Field Station, Van Buren Avenue, and the Big Lost River Rest Area during the second quarter of 2004. The detected tritium levels were less than 1 percent of the action levels established by DEQ-INL. The Three Mile Island-2 fuel currently stored at INTEC is the likely source for the atmospheric tritium observed. No atmospheric tritium was measured at offsite locations during the second quarter of 2004. Average atmospheric tritium concentrations are presented in **Table 6**.

Precipitation samples were collected at five monitoring locations during the second quarter of 2004. Precipitation sampling at Howe was discontinued during the second quarter of 2004, due to contamination of the precipitation sample from irrigation water. Precipitation samples were analyzed for tritium and gamma-emitting radionuclides. Tritium and gamma-emitting radionuclides were below minimum detectable concentration in precipitation collected during the second quarter of 2004. Tritium and cesium-137 analysis results are presented in **Table 7**. Reported values were either the result of a single sample or a weighted mean when more than one precipitation sample was collected during the calendar quarter.

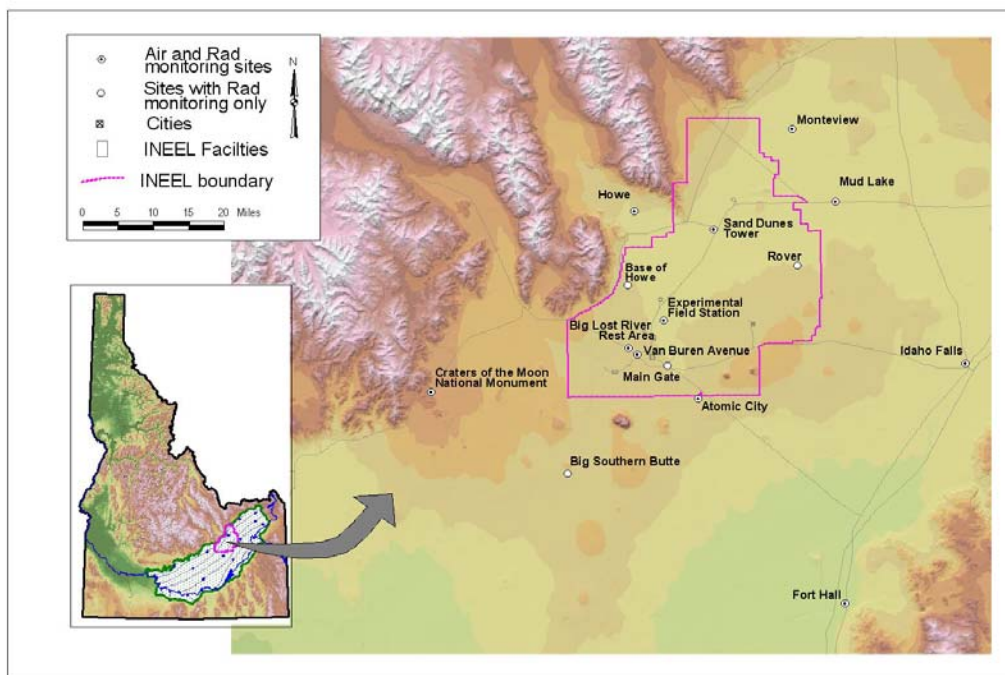


Figure 1. Air and radiation monitoring sites.

Table 1. Sampling locations and sample type.

Station Locations	Sample type ¹				
	PM ₁₀	TSP	Radioiodine	Water Vapor	Precipitation
On-site Locations					
Big Lost River Rest Area		<input type="checkbox"/>	<input type="checkbox"/>	■	■
Experimental Field Station		<input type="checkbox"/>	<input type="checkbox"/>	■	
Sand Dunes Tower		<input type="checkbox"/>	<input type="checkbox"/>	■	
Van Buren Avenue		<input type="checkbox"/>	<input type="checkbox"/>	■	
Boundary Locations					
Atomic City	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	■
Howe		<input type="checkbox"/>	<input type="checkbox"/>	■	■
Monteview		<input type="checkbox"/>	<input type="checkbox"/>	■	■
Mud Lake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	■	■
Distant Locations					
Craters of the Moon		<input type="checkbox"/>	<input type="checkbox"/>	■	
Fort Hall ²		<input type="checkbox"/>	<input type="checkbox"/>	■	
Idaho Falls		<input type="checkbox"/>	<input type="checkbox"/>	■	■
¹ <input type="checkbox"/> Samples collected weekly; ■ Samples collected quarterly. ² Operated by Shoshone-Bannock Tribes.					

Table 2. Range of alpha and beta concentrations for TSP filters, second quarter, 2004. Concentrations are reported in 1×10^{-3} pCi/m³.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
On-Site Locations						
Big Lost River Rest Area	0.5	-	1.1	12.1	-	24.2
Experimental Field Station	0.4	-	1.7	10.5	-	25.4
Sand Dunes Tower	0.3	-	0.9	10.9	-	22.4
Van Buren Avenue	0.5	-	1.1	11.7	-	27.5
Boundary Locations						
Atomic City	0.6	-	1.6	13.8	-	28.0
Howe	0.5	-	1.1	10.8	-	21.6
Monteview	0.1	-	1.0	9.1	-	19.7
Mud Lake	0.3	-	1.5	10.2	-	22.3
Distant Locations						
Craters of the Moon	0.2	-	1.1	9.1	-	22.1
Fort Hall ¹	0.4	-	1.8	11.4	-	21.1
Idaho Falls	0.5	-	1.5	11.7	-	23.7

¹ Operated by Shoshone-Bannock Tribes.

Table 3. Range of alpha and beta concentrations for PM₁₀ filters, second quarter, 2004. Concentrations are reported in 1×10^{-3} pCi/m³.

Station Location	Concentration					
	Gross Alpha			Gross Beta		
Boundary Locations						
Atomic City	0.4	-	1.6	16.2	-	40.9
Mud Lake	0.1	-	2.2	12.3	-	41.0

Table 4. Gamma spectroscopy analysis data of TSP filters, composite sample, second quarter, 2004. Concentrations are reported in 1×10^{-3} pCi/m³ with associated uncertainty (± 2 SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.

concentration (MDC), and correspond to filter composites collected during the calendar quarter.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
On-site Locations			
Big Lost River Rest Area	103	6	<MDC
Experimental Field Station	93	5	<MDC
Sand Dunes Tower	89	5	<MDC
Van Buren Avenue	109	6	<MDC
Boundary Locations			
Atomic City	109	6	<MDC
Howe	103	6	<MDC
Montevieu	83	4	<MDC
Mud Lake	84	4	<MDC
Distant Locations			
Craters of the Moon	99	5	<MDC
Fort Hall ¹	94	5	<MDC
Idaho Falls	102	6	<MDC

¹ Operated by Shoshone-Bannock Tribes.

Table 5. Gamma spectroscopy analysis data of PM₁₀ filters, composite sample, second quarter, 2004. Concentrations are reported in 1×10^{-3} pCi/m³ with associated uncertainty (± 2 SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
Boundary Locations			
Atomic City	128	7	<MDC
Mud Lake	106	6	<MDC

Table 6. Tritium concentrations from atmospheric moisture, second quarter, 2004. Concentrations are reported in pCi/m³ with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Station Location	Tritium		
	Concentration	± 2 SD	MDC
On-site Locations			
Big Lost River Rest Area	0.40 ¹	0.18	0.28
Experimental Field Station	0.28 ¹	0.17	0.27
Sand Dunes Tower	0.11	0.28	0.48
Van Buren Avenue	0.33 ¹	0.17	0.27
Boundary Locations			
Atomic City	0.12	0.36	0.62
Howe	0.08	0.16	0.28
Mud Lake	0.06	0.18	0.31
Montevieu	0.04	0.17	0.30
Distant Locations			
Craters of the Moon	0.03	0.18	0.30
Fort Hall	0.07	0.20	0.34
Idaho Falls	0.05	0.36	0.62

¹ The reported concentrations exceed the MDC.

Table 7. Tritium and cesium-137 concentrations from precipitation, second quarter, 2004. Concentrations are reported in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
On-site Locations						
Big Lost River Rest Area	20	70	120	-0.4	1.2	2.1
Boundary Locations						
Atomic City	-40	70	120	0.0	1.4	2.3
Howe ¹						
Montevieu	-20	70	120	0.4	1.4	2.4
Mud Lake	-20	70	120	-0.2	1.5	2.6
Distant Locations						
Idaho Falls	10	70	120	0.2	1.4	2.4

¹ Precipitation sampling was discontinued during the sampling period due to contamination caused from irrigation water

Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the second quarter of 2004 (**Figure 1**). Each of these stations is instrumented with an electret ionization chamber (EIC), and 11 of the stations also have high-pressure ion chambers (HPIC) (**Table 8**). The Shoshone-Bannock Tribes operate an additional environmental radiation station at Fort Hall. The DEQ-INL reports these results.

HPICs are instruments capable of real-time measurements, and therefore can detect small changes in gamma radiation levels over time. Since HPICs offer real-time gamma radiation measurement and data acquisition, DEQ-INL collects this information electronically and provides graphed data via the world wide web at www.idahoop.org. Contrastly, EICs are a passive integrating system that provides a cumulative measure of environmental gamma radiation exposure. DEQ-INL compared the exposure rates measured by EICs and HPICs and observed that the data correlated very well from both measurement methods; although, EICs tend to over respond by approximately 20 percent, accounting for the slight differences observed between the two measurements. A complete analysis of the radiation measuring devices can be found in *A Comparison of Three Methods for Measuring Environmental Radiation*, Moser, Kristi, Idaho State University, M.S.Thesis, 2002. Each system is used by DEQ-INL to measure gamma radiation for various radiological monitoring objectives. EICs offer an inexpensive methodology to measure gamma radiation over a wide area, particularly in regions which do not have a power source. EICs can also provide valuable gamma radiation data in the event of an emergency. It is because of this reason that EICs are also deployed at 78 locations by DEQ-INL in a widespread network around the INEEL measuring general background radiation. This information is tabulated in **Appendix C**.

Table 9 lists the average radiation exposure rates measured by the HPICs for the quarter. Exposure rates were within the expected range of values for historical background radiation. **Table 10** lists the EIC monitoring results for second quarter, 2004.

Table 8. Summary of instrumentation at radiation monitoring stations.

Station Location	Instrument Type	
	HPIC	EIC
On-site Locations		
Base of Howe	■	■
Big Lost River Rest Area	■	■
Experimental Field Station		■
Main Gate	■	■
Rover	■	■
Sand Dunes Tower	■	■
Van Buren Avenue		■
Boundary Locations		
Atomic City	■	■
Big Southern Butte	■	■
Howe	■	■
Monteview	■	■
Mud Lake	■	■
Distant Locations		
Craters of the Moon		■
Fort Hall ¹	■	■
Idaho Falls	■	■

¹ Operated by Shoshone-Bannock Tribes.

Table 9. Average gamma exposure rates for second quarter 2004, from HPIC network. These rates are expressed in $\mu\text{R/hr}$.

Station Location	Exposure Rate	
	Quarterly Average	$\pm 2 \text{ SD}$
On-site Locations		
Base of Howe	12.6	0.9
Big Lost River Rest Area	13.7	0.9
Main Gate	14.2	0.8
Rover	14.0	0.8
Sand Dunes Tower	13.4	1.8
Boundary Locations		
Atomic City	13.2	0.8
Big Southern Butte	14.0	1.3
Howe	12.6	0.8
Monteview	12.2	0.7
Mud Lake	12.4	0.9
Distant Locations		
Fort Hall ¹	12.8	1.8
Idaho Falls	11.0	1.6

¹ Operated by Shoshone-Bannock Tribes.

Table 10. Electret Ionization chamber (EIC) cumulative average exposure rates for second quarter, 2004. These rates are expressed in $\mu\text{R/hr}$.

Station Location	Exposure Rate	
	Total	$\pm 2 \text{ SD}$
On-site Locations		
Base of Howe	16.7	2.0
Big Lost River Rest Area	20.7	2.0
Experimental Field Station	19.1	2.0
Main Gate	20.4	2.0
Rover	18.1	2.0
Sand Dunes Tower	17.2	1.9
Van Buren Avenue	20.1	2.0
Boundary Locations		
Atomic City	16.0	1.8
Big Southern Butte	17.5	2.0
Howe	14.0	2.2
Monteview	14.9	1.8
Mud Lake	15.6	1.8
Distant Locations		
Craters of the Moon	18.5	2.4
Fort Hall ¹	17.0	1.9
Idaho Falls	14.0	1.8

¹ Operated by Shoshone-Bannock Tribes.

Water Monitoring & Verification Results

Water Monitoring Sampling Program

Water monitoring sites are sampled for the primary purpose of examining trends of key INEEL contaminants and other general groundwater quality indicators. Sites are typically co-sampled with the USGS on the INEEL and DOE's offsite contractor, Environmental Surveillance Education Research (ESER), for selected boundary and distant sites. Comparison of co-sampled results is presented by DEQ-INL annually.

Twenty water monitoring locations were sampled during the second quarter of 2004, 14 sites on and near the INEEL boundary and 6 sites offsite and distant from the INEEL (**Figure 2**).

Gross alpha radioactivity was detected in the sample from one location, INEEL boundary site USGS-011 (**Table 11**). The measurement 3.4 ± 2.0 pCi/L, was below the drinking water standard of 15 pCi/L and within expected levels for naturally-occurring gross alpha radioactivity for groundwater of the Eastern Snake River Plain Aquifer. Gross beta radioactivity was detected in samples from five distant sites and seven onsite and boundary locations. Detectable concentrations for the distant sites ranged from 1.8 ± 1.1 to 4.7 ± 1.2 pCi/L and from 1.7 ± 1.0 to 8.8 ± 1.2 pCi/L for the onsite locations. The highest concentrations were observed for samples from onsite locations USGS-085 and CFA 1, both impacted by historic INEEL operations. The typical background range for gross beta radioactivity in the Snake River Plain Aquifer is 0 to 8.0 pCi/L. No man-made, gamma-emitting radionuclides were detected.

Gross beta analyses are also conducted as a screening tool for beta-emitting radionuclides that were released due to INEEL operations. In the event of known high or unexpected levels of gross beta radioactivity, samples may also be analyzed for technetium-99 and strontium-90. Samples were collected from onsite locations CFA 1, USGS-085, and USGS-087 for technetium-99 and strontium-90 analysis. Technetium-99 was detected in all three of the targeted onsite locations and ranged from 0.7 ± 0.2 to 8.7 ± 0.2 pCi/L, all results were below the derived drinking water standard of 900 pCi/L. Strontium-90 was detected in one of three onsite locations (USGS-085) at a concentration of 3.58 ± 0.95 pCi/L, consistent with historical trends for this site and below the drinking water standard of 8.0 pCi/L. Results for technetium-99 and strontium-90 are found in **Tables 12** and **13**.

Tritium was detected in areas of known INEEL contamination. Detectable levels for tritium ranged from 135 ± 57 to $8,480 \pm 250$ pCi/L, well below the EPA drinking water standard of 20,000 pCi/L. Results for tritium analyses are presented in **Table 14**. Tritium concentrations for CFA 1, RWMC Production, USGS-065, 085, 087, and 124 were consistent with historic trends.

Water samples not exceeding the tritium MDC using the standard analytical method (about 160 pCi/L) are routinely reanalyzed using an electrolytic enrichment method with a much lower MDC (10 to 14 pCi/L). These samples are presented in **Table 15**. Offsite and distant site values were consistent with typical tritium background levels of 0 to 40 pCi/L and significantly below the drinking water EPA limit of 20,000 pCi/L. Tritium concentrations for boundary sites USGS-011, 108, and 124 were elevated due to historic INEEL operations.

Chromium and sulfate concentrations for onsite location USGS-065 were elevated due to past INEEL operations. The chromium concentration of 110 µg/L was above the drinking water standard of 100 µg/L. The sulfate concentration of 163 mg/L were well below the secondary drinking water standard of 250

mg/L. Results for this site are consistent with historic trends. Concentrations of calcium, sodium, chloride, total nitrate + nitrite, and barium were elevated for onsite location CFA 1 due to past INEEL operations. Zinc concentrations observed for sites USGS-011, 100, 103, and 108 were likely due to the corrosion of the submersible pump components installed in these wells. Dissolved trace metal results are found in **Table 16**. Common ions and nutrient concentrations are found in **Table 17**.

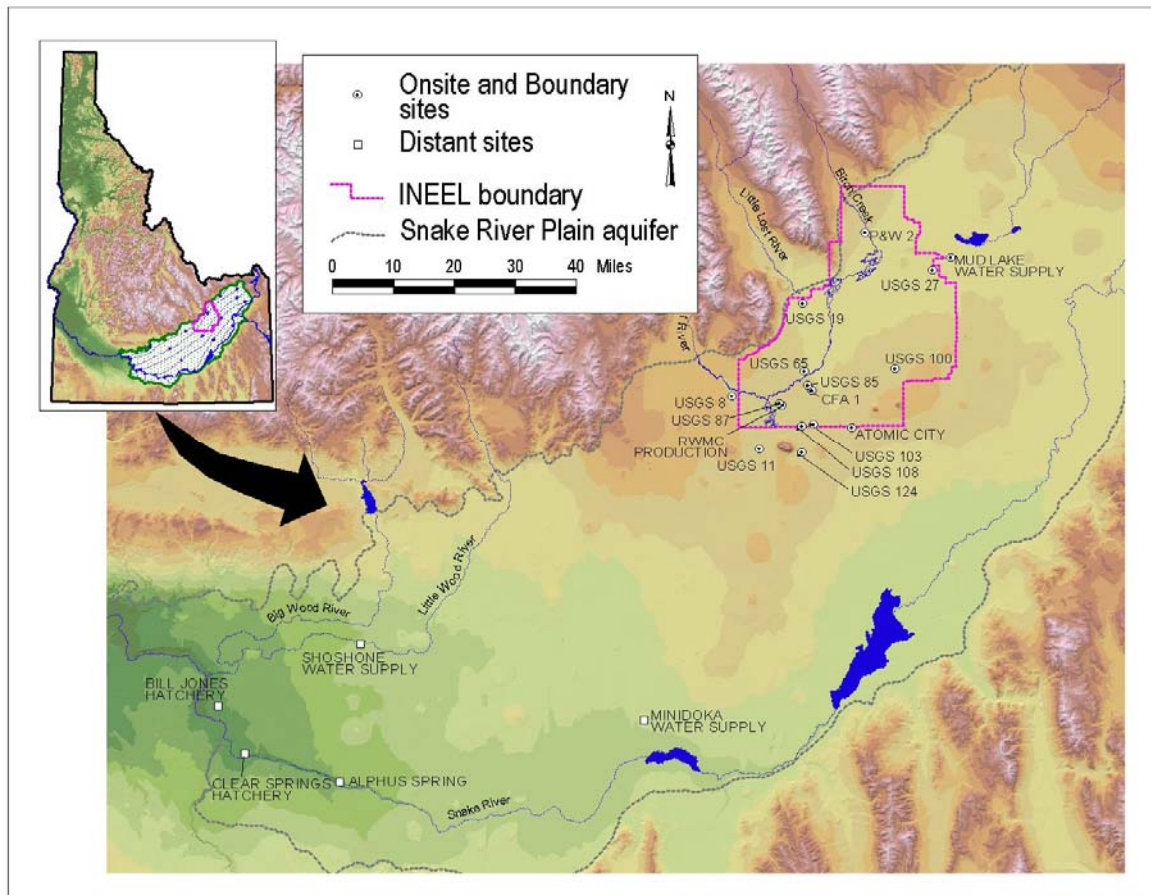


Figure 2. Water monitoring locations.

Table 11. Alpha, beta, and gamma concentrations¹ for water monitoring samples, second quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Gross Alpha			Gross Beta		Man-made gamma-emitting radionuclide Cesium-137
		Concentration	± 2 SD		Concentration	± 2 SD	Concentration
Onsite and Boundary							
CFA 1	4/6/2004	1.7	U	2.5	5.4	1.3	<MDC
Mud Lake Water Supply	5/12/2004	-0.2	U	0.8	2.4	0.5	<MDC
RWMC Production	4/8/2004	-1.0	U	1.9	1.6	U 1.1	<MDC
USGS-008	4/19/2004	2.1	U	1.3	1.8	0.7	<MDC
USGS-011	4/15/2004	3.4		2.0	1.3	U 1.0	<MDC
USGS-019	6/22/2004	-0.7	U	2.1	0.3	U 1.0	<MDC
USGS-027	6/22/2004	-2.7	U	1.9	5.2	0.8	<MDC
USGS-065	4/7/2004	2.3	U	1.9	2.1	U 0.8	<MDC
USGS-085	4/19/2004	1.0	U	2.0	8.8	1.2	<MDC
USGS-087	4/8/2004	1.8	U	1.8	1.2	U 1.0	<MDC
USGS-100	4/21/2004	0.5	U	1.9	2.0	1.0	<MDC
USGS-103	4/15/2004	2.7	U	1.9	1.3	U 1.0	<MDC
USGS-108	4/15/2004	1.2	U	2.1	1.7	1.0	<MDC
USGS-124	4/15/2004	0.3	U	2.1	1.4	U 1.0	<MDC
Offsite and Distant							
Alpheus Spring	5/11/2004	-0.4	U	2.5	4.7	1.2	<MDC
Atomic City	4/6/2004	0.3	U	1.6	1.3	U 1.0	<MDC
Bill Jones Hatchery	5/11/2004	0.7	U	1.8	2.9	1.0	<MDC
Clear Spring	5/11/2004	-0.6	U	2.2	3.6	1.1	<MDC
Minidoka Water Supply	5/11/2004	2.5	U	1.9	1.8	1.1	<MDC
Shoshone Water Supply	5/11/2004	-0.6	U	2.0	2.6	1.2	<MDC
1 Data qualifiers: U = non-detection, J = estimate, R = rejected. <MDC – Less than minimum detectable concentration for analysis by gamma spectroscopy.							

Table 12. Reported concentrations¹ of technetium-99 in water monitoring samples, second quarter, 2004. Concentrations are expressed in pCi/L. Samples were filtered.

Concentrations are expressed in pCi/L. Samples were filtered.

Sample Location	Sample Date	Technetium-99	
		Concentration	± 2 SD
Onsite and Boundary			
CFA 1	4/6/2004	8.7	0.2
USGS-085	4/19/2004	3.9	0.2
USGS-087	4/8/2004	0.7	0.2
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.			

Table 13. Reported concentrations¹ of strontium-90 in water monitoring samples, second quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Technetium-99	
		Concentration	± 2 SD
Onsite and Boundary			
CFA 1	4/6/2004	0.04 U	0.25
USGS-085	4/19/2004	3.58	0.95
USGS-087	4/8/2004	-0.17 U	0.25
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.			

Table 14 Tritium concentrations¹ for water monitoring samples, second quarter, 2004. Concentrations are expressed in pCi/L.

expressed in pCi/L.

Sample Location	Sample Date	Tritium	
		Concentration	± 2 SD
Onsite and Boundary			
Atomic City	4/6/2004	-50 U	70
CFA 1	4/6/2004	8480	250
Mud Lake Water Supply	5/12/2004	20 U	70
RWMC Production ²	4/8/2004	1220	81
USGS-008	4/19/2004	-10 U	70
USGS-011	4/15/2004	80 U	70
USGS-019 ²	6/22/2004	25 U	49
USGS-027	6/22/2004	0 U	70
USGS-065	4/7/2004	8170	240
USGS-085 ²	4/19/2004	2620	106
USGS-087	4/8/2004	880	100
USGS-100	4/21/2004	0 U	70
USGS-103	4/15/2004	-30 U	70
USGS-108	4/15/2004	0 U	70
USGS-124 ²	4/15/2004	135	57
Offsite and Distant			
Alpheus Spring	5/11/2004	90 U	70
Bill Jones Hatchery	5/11/2004	10 U	70
Clear Spring ²	5/11/2004	45 U	49
Minidoka Water Supply	5/11/2004	0 U	70
Shoshone Water Supply	5/11/2004	60 U	70

¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.

² Data reflects the average of an actual sample result and the result of a corresponding laboratory split, recount, re-distillation, or re-evaporation.

Table 15 Enriched tritium concentrations¹ for water monitoring samples, second quarter, 2004. Concentrations are expressed in pCi/L.

Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Tritium	
		Concentration	± 2 SD
Onsite and Boundary			
Atomic City	4/6/2004	11.0	6.0
Mud Lake Water Supply	5/12/2004	2.0 U	5.0
USGS-008	4/19/2004	35.0	7.0
USGS-011	4/15/2004	29.0	7.0
USGS-019 ²	6/22/2004	7.5 U	3.91
USGS-027	6/22/2004	5.0 U	6.0
USGS-100	4/21/2004	19.0	6.0
USGS-103	4/15/2004	11.0	5.0
USGS-108	4/15/2004	62.0	8.0
USGS-124 ²	4/15/2004	155.0	7.07
Offsite and Distant			
Alpheus Spring	5/11/2004	35.0	6.0
Bill Jones Hatchery	5/11/2004	15.0	6.0
Clear Spring ²	5/11/2004	16.0	4.24
Minidoka Water Supply	5/11/2004	8.0 U	5.0
Shoshone Water Supply	5/11/2004	34.0	7.0
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.			
² Data reflects the average of an actual sample result and the result of a corresponding laboratory split, recount, re-distillation, or re-evaporation.			

Table 16. Reported dissolved trace metal concentrations¹ for the water monitoring samples, second quarter, 2004. Concentrations are expressed in µg/L. Samples were filtered.

Sample Location	Sample Date	Concentration				
		Barium	Chromium	Manganese	Lead	Zinc
Groundwater						
Atomic City	4/6/2004	33	<5 U	<2 U	<5 U	39
CFA 1	4/6/2004	100	12	<2 U	<5 U	<5 U
USGS-008	4/19/2004	74	<5 U	<2 U	<5 U	<5 U
USGS-011	4/15/2004	50	<5 U	<2 U	<5 U	94
USGS-019	6/22/2004	70	<5 U	<2 U	<5 U	<5 U
USGS-027	6/22/2004	78	<5 U	4	<5 U	<5 U
USGS-065	4/7/2004	50	110	<2 U	<5 U	<5 U
USGS-085	4/19/2004	89	18	<2 U	<5 U	<5 U
USGS-087	4/8/2004	30	13	<2 U	<5 U	9
USGS-100	4/21/2004	37	<5 U	<2 U	13	222
USGS-103	4/15/2004	43	6	2	<5 U	228
USGS-108	4/15/2004	38	8	<2 U	<5 U	131

¹ Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration.

Table 17. Reported common ions and nutrient concentrations¹ for the water monitoring samples, second quarter, 2004. Concentrations are expressed in mg/L.

Sample Location	Sample Date	Concentration									
		Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity ²	Total Nitrate + Nitrite ³	Total Phosphorus ⁴
Onsite and Boundary											
Atomic City	4/06/2004	37.1	14.0	17.0	3.3	0.71	17.9	16.7	137	1.27	0.017
CFA 1	4/06/2004	77.7	21.6	33.0	4.0	0.31	117.0	31.9	122	3.12	0.02
USGS-008	4/19/2004	47.0	15.5	6.8	1.9	0.24	8.09	21.4	157	<0.005	<0.005
USGS-011	4/15/2004	43.0	14.5	8.1	2.4	0.27	10.4	21.7	142	0.688	0.016
USGS-019	6/22/2004	44.0	16.7	11.0	1.7	0.26	10.8	21.0	163	0.898	0.009
USGS-027	6/22/2004	53.0	18.6	30.0	6.3	0.83	55.2	40.6	144	2.32	0.01
USGS-065	4/07/2004	90.8	19.3	15.0	3.3	0.31	19.6	163.0	128	1.65	0.023
USGS-085	4/19/2004	55.0	14.3	15.0	2.9	0.26	19.8	33.4	159	1.28	0.026
USGS-087	4/08/2004	43.0	14.9	11.0	2.8	0.35	15.9	25.2	134	0.792	0.016
USGS-100	4/21/2004	40.0	12.7	18.0	3.5	0.85	17.5	20.2	135	1.87	0.014
USGS-103	4/15/2004	39.0	15.7	14.0	3.0	0.48	17.0	23.7	136	0.831	0.013
USGS-108	4/15/2004	40.0	15.9	11.0	2.8	0.32	15.0	22.2	135	0.744	0.017
USGS-124	4/15/2004	43.0	17.3	9.6	2.5	0.58	16.9	22.0	143	0.83	0.013
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; ² As CaCO ₃ ³ Dissolved nitrate + nitrite as N ⁴ Dissolved phosphorus as P											

Water Verification Sampling Program

Water verification sites are sampled for the primary purpose of verifying DOE monitoring results for selected CERCA, WLAP, and surveillance monitoring specific to each facility. Selected sites monitored by BBWI, NRF, and ANL-W are sampled each year and a comparison of results presented in the DEQ-INL annual report.

Water verification sampling sites planned to be sampled in 2004 are shown on **Figure 3**. During the second quarter of 2004, the DEQ-INL sampled nine groundwater sites and two wastewater sites on the INEEL.

Gross alpha, beta, and gamma results are presented in **Table 18**. No samples returned detectable gross alpha radioactivity this quarter. Gross beta radioactivity was detected in samples from six of nine onsite locations, one wastewater site, and five groundwater sites. Detectable concentrations ranged from 1.8 ± 1 to 271.1 ± 3.2 pCi/L. The highest concentration observed was at site TAN-10A, an area of known contamination. There were no detections for the man-made, gamma-emitting radionuclide cesium-137.

Strontium-90 was detected in one of three onsite locations, all of which were groundwater sites (**Table 19**). The sample from USGS-052 returned a concentration of 5.9 ± 1.5 pCi/L. USGS-052 is an aquifer well located in the area contaminated by the tank farm at INTEC.

None of the samples collected this quarter contained detectable levels of americium-241 or plutonium isotopes (**Tables 20 and 21**). Technetium-99 was also detected in areas of known contamination at M3S, USGS-052, USGS-106, and USGS-109 (**Table 22**). Detectable concentrations ranged from 0.3 ± 0.2 pCi/L to 344.2 ± 1.1 pCi/L. The highest concentration was observed at USGS-052, an area of known INEEL contamination.

Tritium was also detected in areas of known INEEL contamination, ICPP-MON-A-166, M3S, TAN 10A, USGS-052, and USGS-106, at concentrations below the drinking water standard of 20,000 pCi/L (**Table 23**). Enriched tritium analyses were completed for sites USGS 106 and 109, with samples from both sites returning tritium levels indicative of INEEL contamination (**Table 24**).

Tables 25 and 26 show the reported total concentrations of common ions and total nutrients. Elevated chromium concentrations were reported in several samples, with levels below the drinking water standard of 100 µg/L. Iron values for two samples, TAN-10A (1300 µg/L) and ANL Industrial Waste Pond (430 µg/L), contained concentrations greater than the drinking water secondary standard of 300 µg/L. An elevated level of barium (250 µg/L) was detected at TAN-10A, approximately 1 percent of the 2,000 µg/L drinking water standard. There were no VOC detections this quarter for unfiltered samples collected as part of the ESP water verification sampling program. For a list of VOCs analyzed at sites M1S, M3S, USGS 107, and USGS 109, see **Appendix D**.

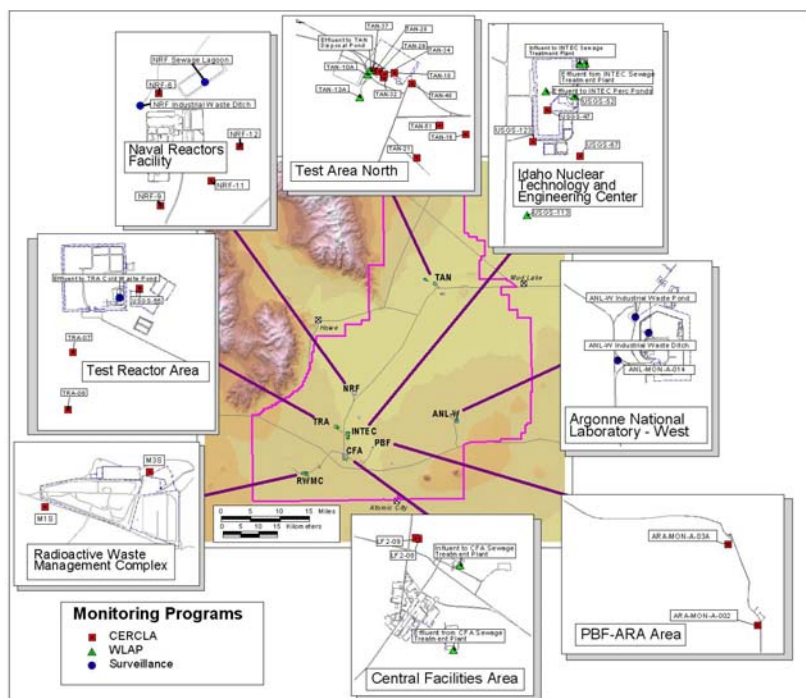


Figure 3. Planned water verification sampling sites for 2004. The purpose of DOE monitoring for the sites is indicated in the figure key.

Table 18. Reported concentrations¹ of gross alpha, gross beta, and cesium-137 in water verification samples, second quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Gross Alpha		Gross Beta		Man-made, gamma-emitting radionuclide Cesium-137	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Wastewater							
ANL Ind. Waste Pond	4/21/2004	2.3 U	1.90	2.0	1.1	0.9 U	1.60
ANL-MON-A-014	4/21/2004	0.6 U	1.80	2.0	1.0	-0.3 U	1.50
Groundwater							
ICPP-MON-A-166	4/7/2004	0.6 U	1.80	1.0 U	1.0	0.4 U	1.40
M1S	4/27/2004	0.7 U	1.10	3.0	0.7	0.9 U	1.20
M3S	4/27/2004	-1.2 U	1.80	2.0	1.0	0.2 U	1.20
TAN-10A ²	4/19/2004	3.9 U	1.98	2711.0	3.2	-0.2 U	2.62
TAN-13A	4/19/2004	1.4 U	1.70	2.0	1.0	0.7 U	1.70
USGS-106	6/23/2004	1.1 U	2.10	1.0 U	1.7	0.6 U	2.90
USGS-109	6/23/2004	-4.2 U	2.10	1.0 U	1.0	0.1 U	1.80

¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.

² Data reflects the average of an actual sample result and the result of a corresponding laboratory split, recount, re-distillation, or re-evaporation.

Table 19. Reported concentrations¹ of strontium-90 in water verification samples, first quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Concentrations are expressed in pCi/L. Samples were not filtered.				
Sample Location	Sample Date	Strontium-90		
		Concentration		± 2 SD
Groundwater				
M1S	4/27/2004	0.24	U	0.28
M3S	4/27/2004	-0.11	U	0.25
USGS-052	4/14/2004	5.9		1.5
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.				

Table 20. Reported concentrations¹ of americium-241 in water verification samples, second quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Americium-241		
		Concentration		±2 SD
Groundwater				
M1S	4/27/2004	0.005	U	0.027
M3S	4/27/2004	0.019	U	0.023

¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 21. Reported concentrations¹ of total plutonium-238, plutonium-239/240, and plutonium-241 in water verification samples, second quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Interfered.

Sample Location	Sample Date	Plutonium-238			Plutonium-239/240			Plutonium-241		
		Concentration		± 2 SD	Concentration		± 2 SD	Concentration		± 2 SD
Groundwater										
M1S	4/27/2004	-0.002	U	0.027	0	U	0	-0.1	U	3.2
M3S	4/27/2004	-0.002	U	0.029	0	U	0	-0.2	U	3.0
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.										

Table 22. Reported concentrations¹ of total technetium-99 in water verification samples, second quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Technetium-99	
		Concentration	± 2 SD
Groundwater			
M1S	4/27/2004	0.3 U	0.2
M3S	4/27/2004	0.6	0.2
USGS-052	4/14/2004	344.2	1.1
USGS-106	6/23/2004	0.7	0.1
USGS-109	6/23/2004	0.4	0.2
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.			

Table 23. Reported concentrations¹ of total tritium in water verification samples, second quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Concentrations are expressed in pCi/L. Samples were not filtered.				
Sample Location	Sample Date	Tritium		
		Concentration		± 2 SD
Wastewater				
ANL Ind. Waste Pond	4/21/2004	-10	U	60
Groundwater				
ANL-MON-A-014 ²	4/21/2004	10	U	49
ICPP-MON-A-166	4/7/2004	120		80
M1S	4/27/2004	-40	U	60
M3S	4/27/2004	1220		110
TAN-10A	4/19/2004	350		80
TAN-13A	4/19/2004	-30	U	70
USGS-052	4/14/2004	2830		150
USGS-106	6/23/2004	880		100
USGS-109	6/23/2004	90	U	70
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.				
² Data reflects the average of an actual sample result and the result of a corresponding laboratory split, recount, re-distillation, or re-evaporation.				

Table 24 Enriched tritium concentrations¹ for water verification samples, second quarter, 2004. Concentrations are expressed in pCi/L.

Concentrations are expressed in pCi/L.			
Sample Location	Sample Date	Tritium	
		Concentration	± 2 SD
Onsite and Boundary			
USGS-106	6/23/2004	938.0	21.0
USGS-109	6/23/2004	89.0	9.0
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected.			

Table 25. Reported total concentrations¹ of common ions for the water verification samples, second quarter, 2004. Concentrations are expressed in mg/L. Samples were not filtered.

Sample Location	Sample Date	Concentration						
		Total Alkalinity	Chloride	Fluoride	Silica	Sulfate	TDS ²	TSS ³
Wastewater								
ANL Ind. Waste Ditch	4/21/2004	142	39.4	0.81	35.2	16.9	270	4.4
ANL Ind. Waste Pond	4/21/2004	98	41.4	0.86	9.93	21.4	220	4.0
Groundwater								
ANL-MON-A-014	4/21/2004	140	18.6	0.77	34.3	16.3	230	<1.0 U
ICPP-MON-A-166	4/7/2004	125	8.44	0.38	26.5	19.7	200	14.0
M1S	4/27/2004	95	13.8	0.30	35.3	20.7	180	<1.0 U
M3S	4/27/2004	143	14.0	0.37	26.3	25.3	130	<1.0 U
TAN-10A	4/19/2004	241	99.5	0.26	20.9	41.0	510	3.2
TAN-13A	4/19/2004	139	3.65	0.27	23.6	14.2	180	<1.0 U
USGS-052	4/14/2004	148	27.3	0.38	22.8	26.3	270	<1.0 U
USGS-106	6/23/2004	158	15.6	0.2	24.0	23.5	250	<1.0 U
USGS-109	6/23/2004	140	13.7	0.27	24.3	25.9	240	<1.0 U

¹ Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration.

² Total dissolved solids.

³ Total suspended solids.

Table 26. Reported total nutrient concentrations¹ for the water verification samples, second quarter, 2004. Concentrations are expressed in mg/L. Samples were not filtered.

Concentrations are expressed in mg/L. Samples were not filtered.

Sample Location	Sample Date	Concentration				
		Nitrite + Nitrate (as nitrogen)	Phosphorus	Total Kjeldahl Nitrogen	Ammonia	Nitrite as Nitrogen
Wastewater						
ANL Ind. Waste Ditch (total)	4/21/2004	1.96	0.264	NR	NR	0.008
ANL Ind. Waste Pond (total)	4/21/2004	0.013	0.111	NR	NR	<0.005 U
Groundwater						
ANL-MON-A-014 (total)	4/21/2004	1.93	0.017	NR	NR	0.007
ICPP-MON-A-166 (total)	4/7/2004	0.347	0.03	0.07	NR	<0.005 U
M1S (total)	4/27/2004	1.08	0.023	NR	NR	NR
M3S (total)	4/27/2004	0.854	0.021	NR	NR	NR
TAN-10A (total)	4/19/2004	0.454	0.092	<0.05 U	<0.005 U	NR
TAN-13A (total)	4/19/2004	0.395	0.028	<0.05 U	<0.005 U	NR
USGS-052 (total)	4/14/2004	3.22	0.026	<0.05 U	NR	NR
USGS-106 (total)	6/23/2004	1.05	0.015	NR	NR	NR
USGS-109 (total)	6/23/2004	0.638	0.009	NR	NR	NR

¹ Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; NR = analysis not requested.

Table 27. Reported metals concentrations¹ for the water verification samples, second quarter, 2004. Samples were not filtered, unless otherwise noted.

Sample Location	Sample Date	Concentration											
		Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Iron (µg/L)
Wastewater													
ANL Ind. Waste Ditch	4/21/2004	44.0	14.1	28.0	3.8	<5 U	42	<1 U	<1 U	<5 U	<10 U	<10 U	30
ANL Ind. Waste Pond	4/21/2004	25.0	12.0	34.0	4.7	<5 U	9	<1 U	<1 U	30	<10 U	20 U	430
Groundwater													
ANL-MON-A-014	4/21/2004	41.0	13.2	19.0	3.5	<5 U	39	<1 U	<1 U	10	<10 U	10	60
ICPP-MON-A-166	4/7/2004	36.6	12.4	9.6	2.6	<5 U	51	<1 U	<1 U	11	<10 U	<10 U	100
M1S ²	4/27/2004	28.0	12.2	11.0	2.6	<5 U	21	<1 U	<1 U	35	<10 U	<10 U	30
M1S	4/27/2004	28.0	12.5	11.0	2.6	<5 U	21	<1 U	<1 U	37	<10 U	<10 U	30
M3S ²	4/24/2004	46.0	15.5	8.4	2.6	<5 U	42	<1 U	<1 U	15	<10 U	<10 U	<10 U
M3S	4/27/2004	47.0	15.7	8.47	2.7	<5 U	43	<1 U	<1 U	17	<10 U	<10 U	30
TAN-10A	4/19/2004	95.0	24.5	52.0	3.8	<5 U	250	<1 U	<1 U	<5 U	<10 U	<10 U	1300
TAN-13A	4/19/2004	44.0	11.6	5.7	2.2	<5 U	79	<1 U	<1 U	<5 U	<10 U	<10 U	30
USGS-052	4/14/2004	54.3	15.5	15.0	2.7	<5 U	95	<1 U	<1 U	8	<10 U	<10 U	10
USGS-106	6/23/2004	49.0	18.2	8.3	2.6	<5 U	49	<1 U	<1 U	6	<10 U	<10 U	10
USGS-109	6/23/2004	43.0	17.0	13.0	3.1	<5 U	31	<1 U	<1 U	6	<10 U	<10 U	210
¹ Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; NR = analysis not requested. ² Filtered sample.													

Table 27 continued. Reported metals concentrations¹ for the verification water monitoring samples, second quarter, 2004. Samples were not filtered, unless otherwise noted.

Sample Location	Sample Date 2004	Concentration										
		Lead (µg/L)	Manganese (µg/L)	Thallium (µg/L)	Nickel (µg/L)	Silver (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Antimony (µg/L)	Aluminum (µg/L)	Selenium (µg/L)	Mercury (µg/L)
Wastewater												
ANL Ind. Waste Ditch	4/21/2004	<5 U	2	<1.5 U	<10 U	<1 U	NR	17	<5 U	<100 U	<10 U	<0.5 U
ANL Ind. Waste Pond	4/21/2004	<5 U	13	<1.5 U	<10 U	<1 U	NR	13	<5 U	500	<10 U	<0.5 U
Groundwater												
ANL-MON-A-014	4/21/2004	<5 U	<2	<1.5 U	<10 U	<1 U	<100 U	9	<5 U	<100 U	<10 U	<0.5 U
ICPP-MON-A-166	4/7/2004	<5 U	22	<1.5 U	<10 U	<1 U	NR	<5 U	<5 U	160	<10 U	<0.5 U
M1S ²	4/27/2004	<5 U	<2 U	<1.5 U	<10 U	<1 U	<100 U	6	<5 U	<100 U	<10 U	<0.5 U
M1S	4/27/2004	<5 U	<2 U	<1.5 U	<10 U	<1 U	<100 U	8	<5 U	<100 U	<10 U	<0.5 U
M3S ²	4/24/2004	<5 U	<2 U	<1.5 U	<10 U	<1 U	<100 U	<5 U	<5 U	<100 U	<10 U	<0.5 U
M3S	4/27/2004	<5 U	<2 U	<1.5 U	<10 U	<1 U	<100 U	<5 U	<5 U	<100 U	<10 U	<0.5 U
TAN-10A	4/19/2004	<5 U	11 U	<1.5 U	<10 U	<1 U	NR	29	<5 U	<100 U	<10 U	<0.5 U
TAN-13A	4/19/2004	<5 U	3	<1.5 U	<10 U	<1 U	NR	140	<5 U	<100 U	<10 U	<0.5 U
USGS-052	4/14/2004	<5 U	<2	<1.5 U	<10 U	<1 U	NR	<5 U	<5 U	<100 U	<10 U	<0.5 U
USGS-106	6/23/2004	8	<2 U	<1.5 U	<10 U	<1 U	NR	120	<5 U	<100 U	<10 U	<0.5 U
USGS-109	6/23/2004	<5 U	5	<1.5 U	<10 U	<1 U	NR	240	<5 U	<100 U	<10 U	<0.5 U
1 Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; NR = analysis not requested. 2 Filtered sample.												

Terrestrial Monitoring Results

The ESP conducts terrestrial (soil and milk) monitoring and verification to provide an indication as to the long-term deposition and migration of contaminants in the environment, and to provide independent verification of DOE's analytical measurement of terrestrial variables.

Results for analyses of milk samples, which are collected monthly, are presented in **Table 28**. Naturally occurring potassium-40 was detected in all samples within the expected range. Iodine-131, a man-made radionuclide, was not detected.

DEQ-INL monitors long-term radiological conditions using measurement devices capable of identifying and measuring quantities of gamma-emitting radionuclides in soil. Monitoring concentrations of gamma-emitting radionuclides in surface soil provides insight to the transport, deposition, and accumulation of radioactive material in the environment as a result of INEEL operations and the historic atmospheric testing of nuclear weapons.

No soil samples were collected during the second quarter of 2004.

Table 28. Gamma spectroscopy analysis data for milk samples, second quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location/Dairy	Sample Date	Naturally occurring gamma-emitting radionuclide Potassium-40 (pCi/L)		Man-made gamma-emitting radionuclide Iodine-131 ¹
		Concentration	± 2 SD	
Monitoring Samples				
Howe/Nelson-Ricks Creamery	4/06/2004	1505	104	<MDC
	5/11/2004	1396	109	<MDC
	6/7/2004	1629	111	<MDC
Mud Lake/Nelson-Ricks Creamery	4/6/2004	1504	114	<MDC
	5/11/2004	1422	116	<MDC
	6/7/2004	1462	117	<MDC
Rupert-Minidoka/Kraft	4/6/2004	1453	102	<MDC
	5/11/2004	1613	110	<MDC
	6/8/2004	1458	116	<MDC
Gooding/Glanbia	4/7/2004	1485	117	<MDC
	5/11/2004	1558	121	<MDC
	6/8/2004	1463	113	<MDC
Pocatello/Meadow Gold	4/6/2004	1451	116	<MDC
	5/11/2004	1613	110	<MDC
	6/8/2004	1375	112	<MDC

Table 28 continued. Gamma spectroscopy analysis data for milk samples, second quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location/Dairy	Sample Date	Naturally occurring gamma-emitting radionuclide Potassium-40 (pCi/L)		Man-made gamma-emitting radionuclide Iodine-131 ¹
		Concentration	± 2 SD	
Verification Samples ²				
Blackfoot	6/2/2004	1454	116	<MDC
Carey	6/1/2004	1790	119	<MDC
Dietrich	5/4/2004	1527	120	<MDC
Roberts	5/4/2004	1585	114	<MDC
Rupert	4/6/2004	1560	106	<MDC
Terreton	4/6/2004	1843	120	<MDC

¹ <MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for Iodine-131).

² DEQ-INL samples collected by the offsite INEEL environmental surveillance contractor.

Quality Assurance

This section summarizes the results of the quality assurance (QA) assessment of the data collected for the second calendar quarter of 2004 for the DEQ-INL's ESP. It also summarizes the quality control (QC) samples (spikes, blanks, and duplicates) submitted to the Idaho Bureau of Laboratories-Boise (IBL) for nonradiological analyses and to Idaho State University's Environmental Monitoring Laboratory (ISU-EML) for radiological analyses during the quarter. All analyses and QC measures in the analytical laboratories are performed in accordance with approved written procedures maintained by each respective analytical laboratory. Sample collection is performed in accordance with written procedures maintained by the DEQ-INL.

The measurement of any physical quantity is subject to uncertainty from errors that may be introduced during sample collection, measurement, calibration, and the reading and reporting of results. While the sum of these inaccuracies cannot be quantified for each analytical result, a quality assurance program can evaluate the overall quality of a data set and possibly identify and address errors or inaccuracies.

Analytical results for blanks, duplicates, and spikes are used to assess the precision, accuracy, and representativeness of results from analyzing laboratories. During the second quarter of 2004, the DEQ-INL submitted 82 QC samples for various radiological and nonradiological analyses (**Table 29**).

Blank Samples

Blank samples consist of matrices that have negligible, acceptably low, or unmeasurable amounts of the analyte(s) of interest in them. They are designed to determine if analyses will provide a "zero" result when no contaminant is expected to be present or an acceptable measure of "background," and therefore monitor any bias that may have been introduced during sample collection, storage, shipment, and analysis. Blank sample results submitted for gross alpha and gross beta screening in air for the second quarter of 2004 are presented in **Table 30**. Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 31**. Data for blank analyses used to assess data quality for tritium in water vapor in air

are presented in **Table 32**. Blank analysis results for metals, common ion, and nutrients in ground and surface water for the second quarter of 2004 are found in **Tables 33 and 34**. Blank analyses results for cesium-137, potassium-40, tritium, enriched tritium, gross alpha, and gross beta in ground and surface water media are presented in **Table 35**.

No anomalies were observed from the assessment of blank samples submitted to the analytical laboratories for the second quarter of 2004.

Duplicate Samples

Duplicate samples are collected in a manner such that the samples are thought to be essentially identical in composition and are used to assess analytical precision. The difference between the original sample and the duplicate sample is expressed as a relative percent difference (RPD) and is used to measure a laboratory's ability to reproduce consistent results. For radiological analyses, the standard deviation of the differences can be used as an indicator of the overall precision of the data set. Duplicate results for ground and surface water are presented in **Table 36** for radiological analyses. Duplicate results for metals and common ion and nutrients in ground and surface water are presented in **Table 37 and 38**.

No anomalies were observed from the assessment of duplicate samples submitted to the analytical laboratories for the second quarter of 2004.

Spiked Samples

Spiked samples are samples to which known concentrations of specific analytes have been added. One indicator of agreement is the difference between the known concentration in the sample and the measured concentration, expressed as percent recovery (%R). This quantity is calculated to assess the bias a laboratory may have in accurately measuring analytes in a particular sample. No field matrices were spiked to assess the influence of the sample media on laboratory performance. However, spiked samples submitted for nonradiological groundwater constituents are summarized in **Tables 39 and 40** for the second quarter of 2004.

Once per quarter, DEQ-INL irradiates a number of electret ionization chambers (EIC) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of 30 mR and a "blind" exposure ranging from 20 to 50 mR. EIC responses are compared directly with the exposure received from the NIST traceable cesium-137 source provided by ISU. EIC response is considered acceptable if each irradiated EIC agrees within 25 percent. The irradiation results for second quarter 2004 are presented in **Table 41**.

No anomalies were observed from the assessment of measuring known irradiated quantities to EICs for the second quarter of 2004.

Analytical QA/QC Assessment

No issues involving sample chain of custody, sample holding times, the analysis of blank, duplicate, and spiked samples were observed during the second quarter of 2004. Methodologies and data reports issued by the contracting laboratories conformed to the requirements of DEQ-INL. No transcription errors were noted for second quarter 2004 data.

Data usability is the measure of data that is not rejected compared to the amount that was expected to be obtained. The data usability rate for the second calendar quarter of 2004 met the criteria of the DEQ-INL ESP and is summarized in **Table 29**. No data were rejected for the quarter.

Preventative Maintenance and Equipment Reliability

All equipment was calibrated and checked according to pre-described periodicity. Service reliability for air sampling equipment for the second quarter 2004 is summarized in **Table 42**. Air sampling equipment requiring repair included:

- The Shoshone-Bannock Tribes installed a low-volume air sampler (radioiodine sampler pump) at the Fort Hall monitoring station. This sampler replaces the intermediate-flow PM₁₀ sampler.
- The low-volume air sampler (radioiodine sampler) at the Big Lost River Rest Area monitoring station (sampler replaced- repair completed).
- The tritium sampler pump at the Atomic City monitoring station (pump replaced - repair completed).
- The hour meter, connected to the tritium sampler pump, at the Craters of the Moon monitoring station (hour meter replaced - repair completed).
- The PM₁₀ sampler pump at the Mud Lake monitoring station (sampler replaced- repair completed).
- The tritium sampler pump at the Craters of the Moon monitoring station (not repaired - low-volume air sampler at this location is being used to sample both radioiodine and tritium).

Resolution of Past Analytical Issues

No significant quality assurance issues were identified during the second calendar quarter of 2004.

Conclusion

All data collected for the second calendar quarter of 2004 has been assigned the applicable qualifiers to designate the appropriate use of the data. In addition, all data has been verified and deemed complete, meeting the requirements and data quality objectives established by DEQ-INL.

Table 29. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL ESP for second quarter, 2004.

Media Sampled	Collection Device	Analyte	Test Analyses	Blank Analyses	Duplicate Analyses	Spike Analyses	Data Rejected ¹	Analyzing Lab ²
AIR								
Particulate (Does not include PM ₁₀ measurements)	4 inch filter	Gross alpha	142	13	0	0	0	ISU-EML
		Gross beta	142	13	0	0	0	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
Particulate	Desiccant column	Tritium	39	7	0	0	0	ISU-EML
Gaseous	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
Precipitation	Poly bottle	Tritium	5	0	0	0	0	ISU-EML
		Gamma emitters	5	0	0	0	0	ISU-EML
WATER								
Groundwater & Surface Water	Grab or composite	Gross alpha	30	2	2	0	0	ISU-EML
		Gross beta	30	2	2	0	0	ISU-EML
		Gamma emitters	30	2	2	0	0	ISU-EML
		Tritium	31	2	2	0	0	ISU-EML
		Enriched tritium	18	2	1	0	0	ISU-EML
		Technetium-99	8	0	1	0	0	ISU-EML
		Radiochemical	9	0	1	0	0	ISU Sub
		Metals	26	2	1	2	0	IBL
		Common Ions	24	2	1	2	0	IBL
		Nutrients	24	2	1	2	0	IBL
		Volatile Organics	4	0	0	0	0	IBL Sub
		Semi-volatile Organics	0	0	0	0	0	IBL Sub
TERRESTRIAL								
Milk	Grab or composite	Gamma emitters	21	0	0	0	0	ISU-EML
Soil	<i>in situ</i>	Gamma emitters	0	0	0	0	0	DEQ-INL
	Grab – “puck”	Gamma emitters	0	0	0	0	0	ISU-EML
RADIATION								
Ambient Air	EICs	Gamma Radiation	93	4	0	8	0	DEQ-INL
	HPICs	Gamma Radiation	NA	NA	NA	NA	NA	DEQ-INL
Totals			705	54	14	14	0	
Total of QC Analyses (blanks, duplicates, and spikes)						82		
Percentage of QC analyses of total analyses ³						11.63		
Percentage of usable data of total analyses ⁴							100	

¹ Combined Laboratory and DEQ-INL rejection criteria (data was rejected for any reason).

² ISU-EML = Idaho State University – Environmental Monitoring Laboratory; ISU Sub = Subcontract laboratory to ISU-EML; IBL = Idaho Bureau of Laboratories, Boise; IBL Sub = Subcontract laboratory to IBL; DEQ-INL = Analyzed by INEEL Oversight and Radiation Control, Idaho Department of Environmental Quality.

³ Analyzing quality control samples at a rate of approximately 5 to 10 percent of the total number of analyses performed for the year is deemed appropriate for the DEQ-INL ESP.

⁴ Data usability rate [total analyses – rejected data]/[total analyses] of 90 percent or higher is acceptable for the DEQ-INL ESP.

Table 30. Blank analysis results for gross alpha and beta in particulate air (TSP) for the second quarter, 2004. Concentrations¹ and associated uncertainties (2 SD) are expressed in 1×10^{-3} pCi/m³.

Collection Period		Corrected volume (m ³) ¹	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
4/1/2004	4/8/2004	1662	0.0	0.1	0.2	0.2
4/8/2004	4/15/2004	1662	0.0	0.1	0.5	0.2
4/15/2004	4/22/2004	1662	0.0	0.1	0.0	0.2
4/22/2004	4/29/2004	1662	0.0	0.2	0.1	0.2
4/29/2004	5/6/2004	1662	0.1	0.1	0.1	0.2
5/6/2004	5/13/2004	1662	0.1	0.1	0.0	0.2
5/13/2004	5/20/2004	1662	0.0	0.1	0.2	0.2
5/20/2004	5/27/2004	1662	0.0	0.2	0.1	0.2
5/27/2004	6/3/2004	1662	-0.1	0.1	0.1	0.2
6/3/2004	6/10/2004	1662	0.0	0.1	0.0	0.2
6/10/2004	6/17/2004	1662	0.1	0.1	0.4	0.2
6/17/2004	6/24/2004	1662	-0.1	0.1	-0.3	0.2
6/24/2004	7/1/2004	1662	0.3	0.1	-0.3	0.3

¹ A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters.

Table 31. Blank analysis results for gamma spectroscopy for TSP particulate air filters for the second quarter, 2004. Concentrations¹ are expressed in 1×10^{-5} pCi/m³ with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Analysis Date	Berillium-7			Ruthenium-106/Rhodium-106			Antimony-125		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
7/20/2004	24	50	84	-3	33	56	-2	16	26

¹ These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters. NR = analysis not requested.

Table 31 continued. Blank analysis results for gamma spectroscopy for TSP particulate air filters for the second quarter, 2004. Concentrations¹ are expressed in 1×10^{-5} pCi/m³ with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Analysis Date	Cesium-134			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
7/20/2004	-1	6	7	4	5	8

¹ These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters. NR = analysis not requested.

Table 32. Blank analysis results for tritium water vapor from air samples for the second quarter, 2004 . Concentrations are expressed in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Sample Number	Start Date	Collect Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP042ZTR01	5/24/2004	5/25/2004	6/7/04	-20	70	130
OP042ZTR02	5/24/2004	5/25/2004	6/7/04	10	70	120
OP042ZTR03	6/22/2004	6/22/2004	6/22/04	-40	70	120
OP042ZTR04	6/22/2004	6/22/2004	6/22/04	30	70	120
OP042ZTR05	7/14/2004	7/16/2004	7/27/2004	-20	70	120
OP042ZTR06	7/14/2004	7/16/2004	7/27/2004	-20	70	120
1 st QTR H-3 2004 Sink	3/16/2004	5/21/2004	6/7/2004	-10	70	120
2 nd QTR H-3 2004 Sink	5/21/2004	7/1/2004	7/27/2004	0	70	120

Table 33. Blank analysis results (in ug/L) for metals in ground and surface water for the second quarter, 2004.

Blank Sample Number	Sample Date	Barium	Chromium	Manganese	Lead	Zinc
042W112	4/8/2004	<2	<5	<2	<5	<5
042W117	4/19/2004	<2	<5	<2	<5	<5

Table 34. Blank analysis results (in mg/L) for common ion and nutrients in ground and surface water for the second quarter, 2004.

Blank Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity as CaCO ₃	Total Nitrogen	Total Phosphorus
042W111, 112, and 113	4/8/2004	<0.1	<0.1	<0.1	<0.1	<0.1	<2	<2	<1	<0.005	<0.005
042W116, 117, and 118	4/19/2004	<0.1	<0.1	<0.1	<0.1	<0.1	<2	<2	1	<0.005	<0.005

Table 35. Blank analysis results for cesium-137, potassium-40, tritium, enriched tritium, gross alpha, and gross beta in ground and surface water samples for the second quarter, 2004. Concentrations¹ are expressed in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Sample Number	Cesium-137			Potassium-40			Tritium			Enriched Tritium			Gross Alpha			Gross Beta		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
042W109	0.2	1.7	2.9	-29	37	65	NR ¹	-	-	NR ¹	-	-	0.0	0.6	1.1	0.0	0.8	1.3
042W114	-0.3	1.6	2.8	-50	49	86	NR ¹	-	-	NR ¹	-	-	0.0	0.6	1.1	0.2	0.8	1.3
042W110	NR	-	-	NR	-	-	-10	70	120	39	8	10	NR	-	-	NR	-	-
042W115	NR	-	-	NR	-	-	-10	70	120	41	7	9	NR	-	-	NR	-	-

¹ NR = analysis not requested.

Table 36. Duplicate radiological analysis results (in pCi/L) for ground and surface water, second quarter, 2004.

Analysis/ Sample Location	Original Sample Number	Analysis Date	Concentration	± 2 SD	Duplicate Sample Number	Analysis Date	Concentration	± 2 SD	/R ₁ -R ₂ /	3(s ₁ ² +s ₂ ²) ^{1/2}	Within Criteria? ¹
Gross Alpha											
Alpheus Spring	042W001	5/11/2004	-0.4	2.5	042W015	5/11/2004	2.3	2.5		10.607	Yes
CFA1	042W022	4/6/2004	1.7	2.5	042W092	4/6/2004	0.9	2.9	0.8	11.487	Yes
Gross Beta											
Alpheus Spring	042W001	5/11/2004	4.7	1.2	042W015	5/11/2004	4.9	1.2	0.2	5.091	Yes
CFA1	042W022	4/6/2004	5.4	1.3	042W092	4/6/2004	7.3	1.3	1.9	5.515	Yes
Gamma Spectroscopy Cesium-137											
Alpheus Spring	042W001	5/11/2004	-0.8	1.6	042W015	5/11/2004	0.7	1.9	1.5	7.452	Yes
CFA1	042W022	4/6/2004	0.9	1.4	042W092	4/6/2004	0.0	1.4	0.9	5.94	Yes
Gamma Spectroscopy Potassium-40											
Alpheus Spring	042W001	5/11/2004	63.0	43.0	042W015	5/11/2004	-4.0	51.0	67.0	200.12	Yes
CFA1	042W022	4/6/2004	18.0	39.0	042W092	4/6/2004	-23.0	50.0	41.0	190.23	Yes
Tritium											
Alpheus Spring	042W002	5/11/2004	90.0	70.0	042W016	5/11/2004	70.0	70.0	20.0	296.98	Yes
CFA1	042W023	4/6/2004	8480.0	250.0	042W093	4/6/2004	8590.0	250.0	110.0	1060.66	Yes
Enriched Tritium											
Alpheus Spring	042W002	5/11/2004	35.0	6.0	042W016	5/11/2004	32.0	7.0	3.0	27.66	Yes
Technicium-99											
CFA1	042W097	4/6/2004	8.7	0.2	042W017	4/6/2004	8.4	0.2	0.3	0.849	Yes
Strontium-90											
CFA1	042W098	4/6/2004	0.04	0.25	042W018	4/6/2004	0.45	0.29	0.41	1.1487	Yes
¹ /R ₁ -R ₂ / ≤ 3(s ₁ ² +s ₂ ²) ^{1/2}											

Table 37. Duplicate results (in ug/L) for metals in ground and surface water for the second quarter, 2004. Relative percent difference (RPD) is acceptable at < 20 percent. Data are presented in the table in the format of “original result/duplicate result (RPD).”

Sample Location	Sample Number	Duplicate Sample Number	Barium	Chromium	Manganese	Lead	Zinc
CFA1	042W025	042W094	100/100 (0.0)	12/13 (8.0)	<2/<2 (0.0)	<5/<5 (0.0)	<5/<5 (0.0)

Table 38. Duplicate sample results (in mg/L) for common ions, and nutrients in ground and surface water for the second quarter, 2004. Relative percent difference (RPD) is acceptable at < 20 percent. Data are presented in the table in the format of “original result/duplicate result (RPD).”

Sample Location	Sample Number	Duplicate Sample Number	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity as CaCO ₃	Total Nitrogen	Total Phosphorus
CFA1	042W024, 025, and 026	042W094, 095, and 096	77.7/72.5 (6.9)	21.6/21.6 (0.0)	33/33 (0.0)	4/4 (0.0)	0.31/0.29 (6.7)	117/115 (1.2)	31.9/31.8 (0.3)	122/122 (0.0)	3.12/3.18 (1.9)	0.02/0.02 (0.0)

Table 39. De-ionized water spike results (in mg/L) for metals in ground and surface water for the second quarter, 2004. A percent recovery of 100 ± 25 is considered acceptable and is recorded in parentheses (%R).

Spike Sample Number	Sample Date	Barium	Chromium	Lead	Manganese	Zinc
		Reference Spike Concentration				
		NA	20.0	5.0	20.0	20.0
042W102	6/22/2004	<2	19 (95)	5 (100)	18 (90)	20 (100)
042W107	6/22/2004	<2	19 (95)	5 (100)	19 (95)	20 (100)

Table 40. De-ionized water spike results (in mg/L) for common ions, and nutrients in ground and surface water for the second quarter, 2004. A percent recovery of 100 ± 25 is considered acceptable and is recorded in parentheses (%R).

Spike Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity as CaCO ₃	Total Nitrogen	Total Phosphorus
		Reference Spike Concentration									
		10.0	10.0	10.0	10.0	1.0	20.0	20.0	NA	5.0	5.0
042W103, 104, and 105	6/22/04	10.1 (101)	10.1 (101)	9.9 (99)	10.3 (103)	1.02 (102)	19 (95)	18.7 (93.5)	2	4.7 (94)	5.25 (105)
042W106, 107, and 108	6/22/04	10.1 (101)	10.1 (101)	10.1 (101)	10.1 (101)	1.02 (102)	19.5 (97.5)	18.8 (94)	<2	4.59 (91.8)	4.91 (98.2)

Table 41. Electret ionization chamber irradiation results (categorized as spiked samples) for second quarter, 2004. A percent recovery (%R) of 100 ± 25 is considered acceptable.

Electret #	Exposure Received		Gross Measured Exposure		Background ¹		Net Exposure ²		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	(mR)	Uncertainty ³ (mR)	
S1	30.1	1.51	30.3	1.40	2.71	1.38	27.6	1.97	91.5
S2	30.1	1.51	27.6	1.41	2.71	1.38	24.9	1.97	82.7
S3	30.1	1.51	28.0	1.36	2.71	1.38	25.3	1.94	84.0
S4	30.1	1.51	28.2	1.38	2.71	1.38	25.5	1.95	84.7
S5	40.0	2.00	37.1	1.41	2.71	1.38	34.4	1.97	86.0
S6	40.0	2.00	37.6	1.36	2.71	1.38	34.9	1.94	87.1
S7	40.0	2.00	40.5	1.31	2.71	1.38	37.8	1.90	94.4
S8	40.0	2.00	37.6	1.41	2.71	1.38	34.9	1.97	87.3

¹ Four EICs were used for control measurements (counted as blanks) and were not irradiated. Background exposure, as measured by the control group, was 2.71 ± 1.38 mR.
² [Gross Measured Exposure] – [Background].
³ Total propagated error.

Table 42. Air sampling field equipment service reliability (percent operational) for second quarter 2004. These values were calculated by dividing the number of weeks the equipment was in operation by the number of weeks in the quarter.

Station Locations	Sample Type ¹				
	PM ₁₀	TSP	Radioiodine	Atmospheric Moisture	Precipitation
Onsite Locations					
Big Lost River Rest Area	NC	100%	92%	100%	100%
Experimental Field Station	NC	100%	100%	100%	NC
Sand Dunes Tower	NC	100%	100%	100%	NC
Van Buren Avenue	NC	100%	100%	100%	NC
Boundary Locations					
Atomic City	100%	100%	CP	92%	100%
Howe	NC	100%	100%	100%	NC ²
Montevieu	NC	100%	100%	100%	100%
Mud Lake	77% ³	100%	CP	100%	100%
Distant Locations					
Craters of the Moon	NC	92% ⁴	100%	92%	NC
Fort Hall ⁵	NC	100%	100%	100%	NC
Idaho Falls	NC	100%	100%	100%	100%
¹ NC = sample not collected at this location; CP = sample collected using the PM ₁₀ sampler at this location. ² Precipitation sampling was discontinued during the sampling period due to contamination caused from irrigation water. ³ A failing sample pump was the most likely cause of the loss of service. The sample pump was replaced on 6/24/04. ⁴ No mechanical repair was required. Speculation as to the loss of service was most likely due to a local loss of electrical power. ⁵ Operated by Shoshone-Bannock Tribes.					

Appendix A

Table A1. Weekly concentrations (in 1×10^{-3} pCi/m³) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
On-Site Locations						
Big Lost River Rest Area	04/01/04	04/08/04	0.8	0.2	24.2	1.0
	04/08/04	04/15/04	1.0	0.2	23.2	1.0
	04/15/04	04/22/04	0.6	0.2	12.1	0.7
	04/22/04	04/29/04	0.7	0.2	20.0	0.9
	04/29/04	05/06/04	0.9	0.2	20.1	0.9
	05/06/04	05/13/04	0.9	0.2	19.2	0.9
	05/13/04	05/20/04	0.8	0.2	16.5	0.8
	05/20/04	05/27/04	0.5	0.2	12.7	0.7
	05/27/04	06/03/04	0.8	0.2	16.7	0.8
	06/03/04	06/10/04	1.1	0.2	21.1	0.9
	06/10/04	06/17/04	0.6	0.2	16.6	0.8
	06/17/04	06/24/04	0.8	0.2	22.2	1.0
	06/24/04	07/01/04	0.9	0.2	20.3	0.9
Experimental Field Station	04/01/04	04/08/04	0.9	0.2	23.5	1.0
	04/08/04	04/15/04	1.2	0.2	24.4	1.0
	04/15/04	04/22/04	0.6	0.2	10.5	0.7
	04/22/04	04/29/04	0.8	0.2	20.9	0.9
	04/29/04	05/06/04	1.1	0.2	20.2	0.9
	05/06/04	05/13/04	1.1	0.3	25.4	1.2
	05/13/04	05/20/04	0.6	0.2	16.5	0.8
	05/20/04	05/27/04	0.4	0.2	11.5	0.7
	05/27/04	06/03/04	1.0	0.3	15.8	0.8
	06/03/04	06/10/04	1.3	0.3	18.3	0.9
	06/10/04	06/17/04	1.4	0.3	13.6	0.8
	06/17/04	06/24/04	1.7	0.3	19.9	0.9
	06/24/04	07/01/04	1.6	0.3	19.0	0.9

Table A1 continued. Weekly concentrations (in 1×10^{-3} pCi/m³) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Sand Dunes Tower	04/01/04	04/08/04	0.6	0.2	22.4	0.9
	04/08/04	04/15/04	0.9	0.2	21.8	0.9
	04/15/04	04/22/04	0.7	0.2	10.9	0.8
	04/22/04	04/29/04	0.4	0.2	14.4	0.7
	04/29/04	05/06/04	0.8	0.2	19.6	0.9
	05/06/04	05/13/04	0.9	0.2	16.9	0.8
	05/13/04	05/20/04	0.5	0.2	14.7	0.7
	05/20/04	05/27/04	0.3	0.2	10.9	0.7
	05/27/04	06/03/04	0.5	0.2	13.4	0.7
	06/03/04	06/10/04	0.9	0.2	19.7	0.9
	06/10/04	06/17/04	0.5	0.2	15.9	0.8
	06/17/04	06/24/04	0.7	0.2	19.6	0.9
	06/24/04	07/01/04	0.9	0.2	19.1	0.9
Van Buren Avenue	04/01/04	04/08/04	0.9	0.2	25.7	1.0
	04/08/04	04/15/04	1.1	0.2	27.5	1.0
	04/15/04	04/22/04	0.6	0.2	11.7	0.7
	04/22/04	04/29/04	0.6	0.2	19.3	0.9
	04/29/04	05/06/04	1.0	0.2	20.4	0.9
	05/06/04	05/13/04	0.7	0.2	18.2	0.8
	05/13/04	05/20/04	0.8	0.2	16.8	0.8
	05/20/04	05/27/04	0.5	0.2	12.8	0.7
	05/27/04	06/03/04	0.8	0.2	17.5	0.8
	06/03/04	06/10/04	1.0	0.2	21.2	0.9
	06/10/04	06/17/04	0.8	0.2	17.1	0.8
	06/17/04	06/24/04	0.8	0.2	22.6	0.9
	06/24/04	07/01/04	1.0	0.2	21.8	0.9
Boundary Locations						
Atomic City	04/01/04	04/08/04	1.1	0.3	28.0	1.1
	04/08/04	04/15/04	1.1	0.3	26.4	1.0
	04/15/04	04/22/04	0.7	0.2	13.8	0.8
	04/22/04	04/29/04	0.8	0.2	20.5	0.9
	04/29/04	05/06/04	1.0	0.2	21.9	0.9
	05/06/04	05/13/04	1.2	0.3	20.9	0.9
	05/13/04	05/20/04	0.8	0.2	17.3	0.9
	05/20/04	05/27/04	0.6	0.2	14.2	0.8
	05/27/04	06/03/04	0.9	0.2	18.3	0.9
	06/03/04	06/10/04	1.6	0.3	22.9	1.0
	06/10/04	06/17/04	0.9	0.2	15.9	0.8
	06/17/04	06/24/04	1.0	0.3	24.3	1.0
	06/24/04	07/01/04	1.2	0.2	23.1	1.0

Table A1 continued. Weekly concentrations (in 1×10^{-3} pCi/m³) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Howe	04/01/04	04/08/04	0.9	0.3	21.6	1.1
	04/08/04	04/15/04	1.0	0.2	20.8	0.9
	04/15/04	04/22/04	0.7	0.2	10.8	0.7
	04/22/04	04/29/04	1.1	0.3	14.2	0.8
	04/29/04	05/06/04	1.0	0.2	18.0	0.8
	05/06/04	05/13/04	0.9	0.2	17.1	0.8
	05/13/04	05/20/04	1.0	0.2	16.1	0.8
	05/20/04	05/27/04	0.6	0.2	11.5	0.7
	05/27/04	06/03/04	0.5	0.2	13.9	0.7
	06/03/04	06/10/04	0.8	0.2	20.2	0.9
	06/10/04	06/17/04	0.5	0.2	16.0	0.8
	06/17/04	06/24/04	0.6	0.2	21.0	0.9
	06/24/04	07/01/04	0.7	0.2	20.9	0.9
Montevideo	04/01/04	04/08/04	0.8	0.2	19.6	0.8
	04/08/04	04/15/04	1.0	0.2	19.7	0.8
	04/15/04	04/22/04	0.6	0.2	9.1	0.6
	04/22/04	04/29/04	0.6	0.2	15.4	0.7
	04/29/04	05/06/04	0.8	0.2	17.3	0.8
	05/06/04	05/13/04	1.0	0.2	14.3	0.7
	05/13/04	05/20/04	0.6	0.2	12.8	0.8
	05/20/04	05/27/04	0.1	0.2	9.3	0.7
	05/27/04	06/03/04	0.5	0.2	13.9	0.7
	06/03/04	06/10/04	0.8	0.2	16.1	0.8
	06/10/04	06/17/04	0.6	0.2	12.7	0.8
	06/17/04	06/24/04	0.6	0.2	17.3	0.8
	06/24/04	07/01/04	0.9	0.2	16.8	0.8
Mud Lake	04/01/04	04/08/04	1.2	0.3	20.5	0.9
	04/08/04	04/15/04	0.9	0.2	22.3	0.9
	04/15/04	04/22/04	0.6	0.2	10.2	0.6
	04/22/04	04/29/04	0.7	0.2	16.5	0.8
	04/29/04	05/06/04	1.0	0.2	17.2	0.8
	05/06/04	05/13/04	0.9	0.2	16.5	0.8
	05/13/04	05/20/04	0.6	0.2	13.7	0.7
	05/20/04	05/27/04	0.3	0.2	11.2	0.7
	05/27/04	06/03/04	0.8	0.2	14.7	0.8
	06/03/04	06/10/04	1.0	0.2	18.1	0.8
	06/10/04	06/17/04	0.6	0.2	14.1	0.7
	06/17/04	06/24/04	1.2	0.3	17.6	0.9
	06/24/04	07/01/04	1.5	0.3	21.4	0.9

Table A1 continued. Weekly concentrations (in 1×10^{-3} pCi/m³) for gross alpha and gross beta analyses for TSP filters for all locations, second quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Distant Locations						
Craters of the Moon	04/01/04	04/08/04	0.8	0.2	20.5	0.9
	04/08/04	04/15/04	1.1	0.2	22.1	0.9
	04/15/04	04/22/04	0.4	0.2	9.1	0.6
	04/22/04	04/29/04	NS ¹		NS ¹	
	04/29/04	05/06/04	0.8	0.2	17.0	0.8
	05/06/04	05/13/04	0.6	0.2	15.0	0.8
	05/13/04	05/20/04	0.5	0.2	13.6	0.7
	05/20/04	05/27/04	0.2	0.2	10.0	0.7
	05/27/04	06/03/04	0.5	0.2	14.0	0.8
	06/03/04	06/10/04	0.9	0.2	18.0	0.9
	06/10/04	06/17/04	0.6	0.2	14.4	0.8
	06/17/04	06/24/04	1.0	0.2	20.5	0.9
	06/24/04	07/01/04	0.8	0.2	19.4	0.9
Fort Hall ²	04/01/04	04/08/04	1.8	0.3	19.8	0.9
	04/08/04	04/15/04	1.4	0.3	21.1	0.9
	04/15/04	04/22/04	0.7	0.2	11.4	0.7
	04/22/04	04/29/04	1.3	0.3	17.0	0.8
	04/29/04	05/06/04	1.1	0.2	16.6	0.8
	05/06/04	05/13/04	1.2	0.2	14.9	0.8
	05/13/04	05/20/04	1.0	0.2	15.6	0.8
	05/20/04	05/27/04	0.4	0.2	12.1	0.7
	05/27/04	06/03/04	0.9	0.2	14.1	0.8
	06/03/04	06/10/04	1.2	0.2	16.2	0.8
	06/10/04	06/17/04	0.7	0.2	13.5	0.7
	06/17/04	06/24/04	1.3	0.3	17.7	0.8
	06/24/04	07/01/04	1.4	0.2	19.1	0.9
Idaho Falls	04/01/04	04/08/04	1.1	0.2	23.7	0.9
	04/08/04	04/15/04	1.1	0.2	22.6	0.9
	04/15/04	04/22/04	1.0	0.3	12.6	0.9
	04/22/04	04/29/04	0.7	0.2	17.6	0.8
	04/29/04	05/06/04	1.2	0.2	19.7	0.9
	05/06/04	05/13/04	1.5	0.3	16.8	0.8
	05/13/04	05/20/04	0.7	0.2	16.5	0.8
	05/20/04	05/27/04	0.5	0.2	11.7	0.7
	05/27/04	06/03/04	0.6	0.2	14.1	0.7
	06/03/04	06/10/04	0.9	0.2	19.8	0.9
	06/10/04	06/17/04	0.7	0.2	15.3	0.8
	06/17/04	06/24/04	0.8	0.2	21.8	0.9
	06/24/04	07/01/04	0.9	0.2	20.6	0.9

¹ No sample due to power failure at Craters of the Moon

² Operated by Shoshone-Bannock Tribes.

Appendix B

Table B1. Weekly concentrations (in 1×10^{-3} pCi/m³) for gross alpha and gross beta analyses for PM₁₀ air samples for all locations, second quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Atomic City	04/01/04	04/08/04	1.4	0.4	40.9	1.8
	04/08/04	04/15/04	1.4	0.4	36.8	1.7
	04/15/04	04/22/04	0.8	0.3	16.2	1.2
	04/22/04	04/29/04	0.8	0.4	29.6	1.5
	04/29/04	05/06/04	1.1	0.4	29.9	1.5
	05/06/04	05/13/04	1.3	0.4	26.2	1.4
	05/13/04	05/20/04	0.9	0.4	23.9	1.4
	05/20/04	05/27/04	0.4	0.4	16.6	1.2
	05/27/04	06/03/04	1.3	0.5	24.8	1.7
	06/03/04	06/10/04	1.6	0.4	31.4	1.6
	06/10/04	06/17/04	0.8	0.4	22.6	1.3
	06/17/04	06/24/04	1.4	0.4	31.1	1.6
	06/24/04	07/01/04	1.2	0.4	30.8	1.6
Mud Lake	04/01/04	04/08/04	1.2	0.4	28.9	1.5
	04/08/04	04/15/04	1.0	0.4	30.2	1.5
	04/15/04	04/22/04	0.8	0.3	13.3	1.1
	04/22/04	04/29/04	0.6	0.4	22.2	1.3
	04/29/04	05/06/04	0.6	0.3	24.4	1.4
	05/06/04	05/13/04	0.9	0.4	21.1	1.3
	05/13/04	05/20/04	0.4	0.3	16.3	1.2
	05/20/04	05/27/04	0.1	0.3	12.3	1.0
	05/27/04	06/03/04	NS ¹		NS ¹	
	06/03/04	06/10/04	2.2	0.7	41.0	2.5
	06/10/04	06/17/04	NS ¹		NS ¹	
	06/17/04	06/24/04	0.9	0.4	23.7	1.4
	06/24/04	07/01/04	NS ¹		NS ¹	
¹ No sample obtained due to equipment failure.						

Appendix C

Table C-1. Results for additional electret locations, second quarter, 2004.

Sample Location	Net Corrected Exposure (uR/h)	± 2 SD (uR/h)
Dubois	16.14	3.33
Hamer	19.85	2.04
Sugar City	20.00	1.97
Blue Dome	17.24	1.96
TAN	18.57	2.05
ICPP I	24.37	2.25
NRF	21.95	2.16
EBR II	20.80	2.12
TRA	19.11	2.07
Grid 3	20.10	2.10
PBF	20.08	2.10
CFA	19.28	2.07
RWMC	16.55	1.92
Roberts	20.16	1.68
Kettle Butte	17.39	1.93
Blackfoot	14.24	1.83
Taber	17.79	1.93
Aberdeen	18.32	1.92
Minidoka	16.46	1.86
Arco	15.35	2.24
Richfield	18.22	2.35
EBR I	17.86	1.96
Reno Ranch	15.26	1.91
Rover Rd. 2.9mi	21.09	2.10
Rover Rd. 4.9mi	20.40	2.08
Rover Rd. 6.3mi	19.82	2.06
Rover Rd. 6.8mi	18.31	2.01
Rover Rd. 8.8mi	19.16	2.03
Rover Rd. 10.8mi	20.27	2.07
Rover Rd. 15.4mi	21.29	2.10
Rover Rd. 17.4mi	22.67	2.15
MP1 - 22/33	18.55	1.95
MP3 - 22/33	15.78	1.87
MP5 - 22/33	15.56	1.86
MP7 - 22/33	15.31	1.86
MP9 - 22/33	16.36	1.89
MP23 - 33	16.09	1.88
MP25 - 33	15.37	1.86

Table C-1 continued. Results for additional electret locations, second quarter, 2004.

Sample Location	Net Corrected Exposure (uR/h)	± 2 SD (uR/h)
MP27 - 33	19.28	1.98
MP29 - 33	17.64	1.93
MP31 - 33	17.95	1.93
MP33 - 33	19.67	1.99
MP35 - 33	14.71	1.84
MP37 - 33	18.21	1.94
MP39 - 33	18.24	1.94
MP41 - 33	21.01	2.04
MP43 - 33	19.95	2.00
Mud Lake - Bank of Commerce	20.73	2.03
MP1 - Lincoln Blvd	16.99	2.00
MP5 - Lincoln Blvd	21.05	2.13
MP7 - Lincoln Blvd	19.80	2.09
MP9 - Lincoln Blvd	20.37	2.11
MP11 - Lincoln Blvd	19.19	2.07
MP13 - Lincoln Blvd	19.43	2.08
MP15 - Lincoln Blvd	20.94	2.13
MP17 - Lincoln Blvd	19.52	2.08
MP19 - Lincoln Blvd	16.91	2.00
MP21 - Lincoln Blvd	17.14	2.01
MP264 - 20	18.61	1.98
MP266 - 20	14.81	1.87
MP268 - 20	18.25	1.97
MP270 - 20	17.93	1.96
MP272 - 20	18.29	2.07
MP274 - 20	15.24	1.88
MP276 - 20	19.10	3.46
MP270 - 20/26	16.66	1.93
MP268 - 20/26	16.58	1.92
MP266 - 20/26	17.50	1.95
MP263 - 20/26	17.84	1.96
MP261 - 20/26	17.74	1.96
MP259 - 20/26	15.96	1.91
Howe Fence-line 1.4mi	16.09	1.93
Howe Fence-line 2.3mi	18.01	1.99
Howe Fence-line 4.2mi	16.99	1.96
Howe Fence-line 6.5mi	19.79	2.04
Howe Fence-line 8.6mi	18.80	2.01
Howe Fence-line 9.7mi	16.33	1.93
Howe Met. Tower	16.36	1.86

Appendix D

Table D-1. List of volatile organic compounds (VOCs) analyzed for water verification samples, second quarter, 2004. Minimum detectable concentrations (MDC) are expressed in µg/L.

Analyte	MDC
Benzene	0.5
Carbon tetrachloride	0.5
Chlorobenzene	0.5
1,4-Dichlorobenzene	0.5
1,2-Dichlorobenzene	0.5
1,2-Dichloroethane	0.5
1,1-Dichloroethene	0.5
cis-1,2-Dichloroethene	0.5
trans-1,2-Dichloroethene	0.5
1,2-Dichloropropane	0.5
Ethylbenzene	0.5
Methylene Chloride	0.5
Styrene	0.5
Tetrachloroethylene (PERC)	0.5
Toluene	0.5
1,2,4-Trichlorobenzene	0.5
1,1,1-Trichloroethane	0.5
1,1,2-Trichloroethane	0.5
Trichloroethylene	0.5
Vinyl chloride	0.5
Xylenes (total)	0.5
Bromodichloromethane	0.5
Dibromochloromethane	0.5
Bromoform	0.5
Chloroform	0.5
Bromobenzene	0.5
Bromochloromethane	0.5
Bromomethane	0.5
n-Butylbenzene	0.5
sec-Butylbenzene	0.5
tert-Butylbenzene	0.5
Chloroethane	0.5
Chloromethane	0.5
2-Chlorotoluene	0.5
4-Chlorotoluene	0.5
1,2-Dibromo-3-chloropropane (DBCP)	1.0
1,2-Dibromoethane (EDB)	0.5

Table D-1 continued. List of volatile organic compounds (VOCs) analyzed for water verification samples, second quarter, 2004. Minimum detectable concentrations (MDC) are expressed in µg/L.

Analyte	MDC
Dibromomethane	0.5
1,3-Dichlorobenzene	0.5
Dichlorodifluoromethane	0.5
1,1-Dichloroethane	0.5
1,3-Dichloropropane	0.5
2,2-Dichloropropane	0.5
1,1-Dichloropropene	0.5
cis-1,3-Dichloropropene	0.5
trans-1,3-Dichloropropene	0.5
Hexachlorobutadiene	0.5
Isopropylbenzene	0.5
p-Isopropyltoluene	0.5
Methyl Tert Butyl Ether (MTBE)	1.0
Naphthalene	1.0
n-Propylbenzene	0.5
1,1,1,2-Tetrachloroethane	0.5
1,1,2,2-Tetrachloroethane	0.5
1,2,3-Trichlorobenzene	1.25
Trichlorofluoromethane	0.5
1,2,3-Trichloropropane	0.5
1,2,4-Trimethylbenzene	0.5
1,3,5-Trimethylbenzene	0.5